



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

Example: $a, b, c, d=6, 5, 3, 4$, respectively, in (9) gives

$$y^3 - 86y^2 + 894y - 1216 = 0.$$

By Horner's method, $y=75.7270176 +$ Diagonal $2x=6.1533 +$ agreeing with a close drawing.

[Mr. Bell sent us this solution March 14, 1895. We have looked it over carefully and believe that it is entirely correct. The solution published in the July-August number of Vol. II is of a particular case. EDITOR.]

CALCULUS.

Conducted by J. M. COLAW, Monterey, Va. All contributions to this department should be sent to him.

SOLUTIONS OF PROBLEMS.

57. Proposed by F. M. McGAW, A. M., Professor of Mathematics in Bordentown Military Institute, Bordentown, New Jersey.

Solve the following equation: $(1+x^2)\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} + 2y = 0.$

I. Solution by WILLIAM E. HEAL, A. M., Member of the London Mathematical Society, and Treasurer of Grant County, Marion, Indiana.

Let $y = bx \left[\int z dx + c \right]$ and the equation becomes

$$x(1+x^2)\frac{dz}{dx} + 2z = 0, \text{ or } \frac{dz}{z} + \frac{2dx}{x(1+x^2)} = 0.$$

$$\therefore z = c'(1 + [1/x^2]); y = bx\{c'(x - [1/x]) + c\}, = Bx + A(1 - x^2).$$

II. Solution by H. C. WHITAKER, M. E., Ph. D., Professor of Mathematics in Manual Training School, Philadelphia, Pennsylvania.

Proceeding to obtain a solution in series, both values of y are found to terminate immediately. The complete primitive is $y = Ax + B(x^2 - 1).$

III. Solution by WILLIAM HOOVER, A. M., Ph. D., Professor of Mathematics and Astronomy in Ohio State University, Athens, Ohio.

It is shown (*Forsyth's Differential Equations*, Article 58) that

$$d^2y/dx^2 + P(dy/dx) + Qy = R \dots\dots\dots(1)$$

gives, when $y = vw \dots\dots\dots(2).$

$$w \frac{d^2 v}{dx^2} + (2 \frac{dw}{dx} + Pw) \frac{dv}{dx} + (\frac{d^2 w}{dx^2} + P \frac{dw}{dx} + Qw)v = R \dots \dots \dots (3),$$

with the conditional equations :

$$\frac{d^2 w}{dx^2} + P \frac{dw}{dx} + Qw = 0 \dots \dots \dots (4),$$

$$\frac{d^2 v}{dx^2} + [(2/w) \frac{dw}{dx} + P] \frac{dv}{dx} = R/w \dots \dots \dots (5).$$

w being supposed known from (4) gives

$$w^2 \frac{dv}{dx} e^{-\int P dx} = A + \int w R e^{\int P dx} dx \dots \dots \dots (6),$$

$$\text{and } v = B + A \int \frac{dx}{w^2} e^{-\int P dx} + \int \frac{dx}{w^2} e^{-\int P dx} \int w R e^{\int P dx} dx \dots \dots \dots (7).$$

Now (4) is of the same form as (1) excepting that the right member is 0 ; so that if we have a solution of (4) we have that of (1) when $R=0$.

The given equation is

$$\frac{d^2 y}{dx^2} - \frac{2x}{1+x^2} \frac{dy}{dx} + \frac{2}{1+x^2} y = 0 \dots \dots \dots (8);$$

then $P = -2x/(1+x^2)$, and a particular solution is

$$y = x \dots \dots \dots (9), \text{ or } w = x \dots \dots \dots (10).$$

$$\text{Then (7) gives } v = B - A \int \left(\frac{dx}{x^2} + 1 \right) = B + A(x - [x/1]),$$

and $y = vx = Bx + A(x^2 - 1)$, the required solution.

[As will be seen from the last solution both forms are correct. The first form is given as the answer, on page 336 of *Byerly's Integral Calculus*. EDITOR.]

Also solved by O. W. ANTHONY, W. C. M. BLACK, J. SCHEFFER, G. B. M. ZERE and P. S. BERG.

58. Proposed by O. W. ANTHONY, M. Sc., Professor of Mathematics in Columbian University, Washington, D. C.

A line passes through a fixed point and rotates uniformly about this point. Another line passes through a point which moves uniformly along the arc of a given curve and rotates uniformly about this point. Develop a method for finding the locus of intersection of these two lines. Apply to case of circle and straight line.